

WHAT IS CLAIMED IS:

1. A system for network packet processing comprising:
 - a packet reception subsystem configured to receive network packets comprising common case network packets and non-common case network packets;
 - a fast-path acceleration subsystem configured to process the common case network packets using a hardware acceleration component; and
 - a slow-path subsystem configured to process the non-common case network packets using software-based code executed on one or more general purpose processors.
2. The system of Claim 1 wherein, the common case network packets comprise in-sequence network packets
3. The system of Claim 1 wherein, the non-common case network packets comprise infrequent case network packets.
4. The system of Claim 1 wherein, the non-common case network packets comprise exception case network packets.
5. The system of Claim 1 wherein, the non-common case network packets comprise out-of-sequence network packets.
6. The system of Claim 1 wherein, the slow-path subsystem is coupled with limited hardware acceleration.
7. The system of Claim 6 wherein, the slow-path subsystem is coupled to the fast path acceleration subsystem such that after processing of the non-common case network packets in slow-path subsystem, the network packets are subsequently processed by the fast-path acceleration subsystem.
8. The system of Claim 1 wherein, the fast-path acceleration subsystem is configured to process network packets arriving concurrently on one or more network ports.
9. The system of Claim 1 wherein, the fast path acceleration subsystem is configured to operate at approximately line rate and avoid stalls while processing packets in a pipelined manner.

10. The system of Claim 9 wherein, stalls in network processing through the fast-path acceleration subsystem are avoided, in part, using network packet buffering components configured with rewind and fast-forward mechanisms to remove network packets containing errors or other exceptions during continuous operation at approximately line rate.

11. The system of Claim 10 wherein, line rate bandwidth capacity is approximately 10 Gigabit / second or more.

12. The system of Claim 1 wherein, the fast-past and slow-path subsystems are configured to operate with a plurality of networking protocols.

13. The system of Claim 12 wherein, the networking protocols are selected from the group consisting of: TCP/IP, iSCSI, UDP, SCTP, iWarp, SDP, and DDP.

14. The system of Claim 1 wherein, network packets are transmitted in a network where Ethernet is employed as a layer 2 protocol and IP is employed as a layer 3 protocol according to OSI nomenclature for networking protocols.

15. The system of Claim 1 wherein, the network packets comprise TCP/IP and iSCSI components that are simultaneously resolved using the fast-path and slow-path subsystems.

16. The system of Claim 1 further comprising, a parser component configured to parse a plurality of incoming network packet streams, demarcate network packet boundaries, identify underlying network protocols, and categorize the network packets for fast-path or slow-path processing.

17. The system of Claim 16 wherein, the incoming network packet streams originate from a plurality of network ports.

18. The system of Claim 1 further comprising, an ingress buffer configured to buffer incoming packets as necessary to maintain processing throughput.

19. The system of Claim 1 further comprising, a dispatcher configured to route network packets to the fast-path and slow-path subsystems.

20. The system of Claim 1 wherein, network packets processed by the slow-path subsystem are relatively quickly returned to the fast-path subsystem to improve networking performance.

21. A system for network packet processing applying a hardware pipelining approach, the system comprising:

- at least one pre-classifier module, assigned for at least one network port receiving incoming network packet streams, the at least one pre-classifier module used to partially parse and validate the incoming network packet streams;

- a parser module configured to parse the incoming network packet streams to demarcate packet boundaries for one or more network protocol segments contained within the network packet streams, the parser module further configured to categorize network packets for processing in a hardware-accelerated fast path if the network packets are identified as being in-sequence or a software-assisted slow-path if the network packets are identified as being out-of-sequence;

- an ingress buffer queue associated with the at least one network port configured to buffer incoming network packets while they are validated;

- a dispatcher module configured to dispatch information extracted from the network packets to packet processing and protocol processing components according to whether the network packets are to be processed by the hardware-accelerated fast path or the software-assisted slow path; and

- a packet processor configured to process the network packets and determine at which location in an application memory area data contained within the network packets should be deposited, the packet processor further configured to effectuate the deposition of the data contained within the network packets into the identified location.

22. The system of Claim 21 wherein, the ingress buffer queue validates network packets prior to the network packets being deposited in main memory.

23. The system of Claim 21 wherein, out-of-sequence network packets processed in the software-assisted slow-path are transformed into in-sequence network packets that are subsequently returned to the hardware-accelerated fast path for processing thereby improving overall processing throughput.

24. The system of Claim 21 wherein, the network packet streams contain TCP/IP and iSCSI network packets.

25. The system of Claim 21 further comprising, a CAM component that operates in connection with the parser and retrieves upper layer connection information characterizing the network packets.

26. The system of Claim 25 wherein, the upper layer connection information comprises a connection number associated with each network packet.

27. The system of Claim 21 wherein, the packet processor comprises an iSCSI protocol data unit processor that processes iSCSI protocol data units contained within the network packets and determines where data contained within the iSCSI protocol data units is to be deposited in application memory.

28. The system of Claim 27 wherein, the iSCSI protocol data unit processor further transfers iSCSI headers and non-SCSI data associated with the network packets to an iSCSI connection queue for SCSI-layer processing.

29. The system of Claim 21 wherein, the pre-classifier module further extracts header information from the incoming packet stream and reformats the header information into a more accessible form thereby improving the efficiency of downstream processing.

30. The system of Claim 21 wherein, the parser module is configured with a context switching functionality that facilitates parsing embedded packets contained within concurrently arriving packet streams from two or more network ports.

31. The system of Claim 30 wherein, the incoming network packet stream comprises a time-multiplexed data stream and the context switching functionality of the parser module provides a means to switch between contexts to identify and process network packets associated with each network port.

32. The system of Claim 31 wherein, the context switching functionality of the parser module can be accomplished approximately once each cycle.

33. The system of Claim 21 wherein, the parser module further determines for each network packet whether the network packet is an in-sequence TCP frame or an out-of-sequence TCP frame.

34. The system of Claim 21 wherein, the parser module further determines for each network packet whether iSCSI frames are present and, if so, demarcates the iSCSI frames to facilitate subsequent processing.

35. The system of Claim 21 wherein, the parser module further determines for each network packet whether TCP or IP option handling is required to process the network packets.

36. The system of Claim 21 wherein, the parser module further determines for each network packet whether an associated IP frame is fragmented.

37. The system of Claim 21 wherein, the parser module further determines for each network packet whether an error condition or exception condition is present.

38. The system of Claim 37 wherein, the parser module provides a mechanism to drop network packets determined to contain errors thereby preserving the efficiency of fast-path processing.

39. The system of Claim 21 further comprising, a content addressable memory component that stores connection information for network frames within each network stream that are accessible to the parser module for purposes of lookup and identification.

40. The system of Claim 21 wherein, the ingress buffer queue is configured with a bandwidth that is approximately matched to the bandwidth of network communications so as to maintain approximately line rate flow of incoming network streams.

41. The system of Claim 40 wherein, the available bandwidth of the ingress buffer queue alleviates incoming network stream flow control.

42. The system of Claim 21 wherein, the ingress buffer queue utilizes a random access read technique to access data from the queue.

43. The system of Claim 21 further comprising, a job queue module used as a communications intermediary between the parser module and the dispatcher module, the job queue module further comprising at least one job FIFO for each network port allowing the parser module to process incoming time-multiplexed packet streams in a pipelined manner.

44. The system of Claim 43 wherein, the dispatcher accesses the job queue module retrieves control information and data for a selected network stream associated with a selected network port, and forwards the control information and data to appropriate destinations in the system.

45. The system of Claim 21 wherein, the packet processor comprises an iSCSI protocol data unit (PDU) engine that receives TCP network packet data contained within the network stream and resolves iSCSI header and data segment boundaries contained within the TCP network packet data and further determines iSCSI protocol data unit types associated with the TCP network packet data.

46. The system of Claim 45 wherein, a line rate dispatcher module determines whether incoming TCP segments are in-sequence or not, if one or more segments are missing, or if one or more segments are duplicates of previously received segments.

47. The system of Claim 46 wherein, the iSCSI PDU engine further coalesces information at approximately line rate.

48. The system of Claim 46 wherein, the iSCSI PDU engine is configured to partially save information between frames as necessary.